

327 IAC 8-13-10 Operation and Maintenance of Treatment Unit

Authority:

Affected:

Sec. 10 (a) Filtration requirements for the operation and maintenance of a treatment unit are as follows:

(1) The application of any type of filtration must be supported by water quality data representing a reasonable period of time to characterize the variations in water quality.

(2) Experimental treatment studies may be required to demonstrate the applicability of the method of filtration proposed.

(3) Requirements for rapid rate gravity filters are as follows:

(A) Rapid rate gravity filters may only be used after coagulation, flocculation and sedimentation.

(B) Rate of filtration shall be no less than:

(i) Two (2) gallons per minute per square feet for single media.

(ii) Three (3) gallons per minute per square for dual media.

(iii) Four (4) gallons per minute per square feet for tri media.

(C) At least two units shall be provided.

(D) Filter material shall meet all of the following:

(i) Clean silica sand or other natural or synthetic media approved by the agency.

(ii) A total depth of not less than twenty-four (24) inches and not more than thirty (30) inches.

(iii) A uniformity size range of the smallest material not greater than forty-five hundredths (0.45) millimeters to fifty-five hundredths (0.55) millimeters.

(iv) A uniformity coefficient of the smallest material not greater than one and sixty-five hundredths (1.65) millimeters.

(v) A minimum of twelve (12) inches of media with an effective size range no greater than forty-five hundredths (0.45) millimeters to fifty-five hundredths (0.55) millimeters, and a specific gravity greater than other filtering materials within the filter.

(E) Requirements for different types of media are as follows:

(i) Sand shall have an effective size of forty-five hundredths (0.45) millimeters to fifty-five hundredths (0.55) millimeters and a uniformity coefficient of not greater than one and sixty-five hundredths (1.65) millimeters.

(ii) Clean crushed anthracite or sand and anthracite may be approved by the agency if supported by experimental data specific to the project. Anthracite used as the only media shall have an effective size from forty-five hundredths (0.45) millimeters to fifty-five hundredths (0.55) millimeters and a uniformity coefficient not greater than one and sixty-five hundredths (1.65) millimeters. Anthracite used to cap sand filters shall have an effective size from eight tenths (0.8) millimeters to one and two tenths (1.2) millimeters and a uniformity

coefficient not greater than one and eighty-five hundredths (1.85) millimeters. Effective size of anthracite for iron and manganese removal from potable groundwater shall be a maximum of eight tenths (0.8) millimeters. Effective sizes greater than eight tenths (0.8) millimeters may be approved by the agency based upon onsite pilot plant studies.

(iii) Granular activated carbon (GAC) media may be considered only after pilot or full scale testing and with prior approval of the agency. The media shall meet the basic specifications for filter media as given in this section except that larger size media may be allowed by the agency where full scale tests have demonstrated that treatment goals can be met under all conditions. There shall be provision for a free chlorine residual and adequate contact time in the water following the filters and prior to distribution. There shall be means for periodic treatment of filter material for control of bacterial and other growth. Provisions shall be made for frequent replacement or regeneration of GAC if used for filtration.

(iv) Other media may be approved, but only on the basis of pilot tests and experience which demonstrate that the requirements of this section will be met.

(v) Torpedo sand and gravel shall be provided as supporting media except when proprietary filter bottoms are used. In that case, the agency, on the basis of substantiating information provided by the owner, may allow elimination of certain layers of supporting media or a reduction in the depth of the layers. Otherwise, the following apply:

(AA) A three (3) inch layer of torpedo sand shall be used as a supporting media for the filter sand. The torpedo sand shall have an effective size of eight tenths (0.8) millimeters to two (2.0) millimeters, and a uniformity coefficient not greater than one and seven tenths (1.7) millimeters.

(BB) Gravel, when used as the supporting media, shall consist of hard, rounded silica particles and may not include flat or elongated particles. The most coarse gravel shall be two (2) inches in size when the gravel rests directly on the strainer system, and shall extend above the top of the perforated laterals or strainer nozzles.

(F) Backlashing facilities shall be designed to provide:

(i) A minimum rate of fifteen (15) gallons per minute per square foot, consistent with water temperatures and specific gravity of the filter media. A rate of twenty (20) gallons per minute per square foot or a rate necessary to provide for a fifty percent (50%) expansion of the filter bed is recommended. A reduced rate of ten (10) gallons per minute per square foot may be acceptable for full depth anthracite or granular activated carbon filters. A reduced rate of backlashing is acceptable when air scouring is provided.

(ii) Backlashing by filtered water at the required rate from washwater

tanks, a washwater pump from a reservoir or a high service main, or a combination of these.

(iii) Washwater pumps in duplicate unless an alternate means of obtaining washwater is available.

(iv) Backlashing of not less than fifteen (15) minutes of one filter at the design rate of wash.

(v) A washwater regulator or valve on the washwater line to obtain the desired rate of filter wash with the washwater valves on the individual filters open wide.

(vi) A rate-of-flow indicator and totalizer on the main washwater line, located for convenient reading by the operator during the washing process.

(vii) Backlashing by a method which prevents rapid changes in the backwash water flow.

(4) Rapid rate pressure requirements are as follows:

(A) The normal use of these filters is for iron and manganese removal.

Pressure filters shall not be used in the filtration of surface or other **polluted** water or following lime-soda softening.

(B) Rate of filtration shall not exceed three (3) gallons per minute per square foot of filter area except where implant testing as approved by the agency has demonstrated satisfactory results at higher rate.

(5) All filters shall have an easily readable meter or flow indicator on each battery of filters and on each backwash drain.

(6) Requirements for backwash wastewater from iron & manganese filters are as follows:

(A) When discharging to a sanitary sewer, a holding tank for backwash wastewater from iron and manganese removal filters shall be provided if the agency determines that it is necessary to prevent overloading the sewers or sewage treatment plant. When a holding tank is provided it shall meet the requirements of subdivision (4).

(B) The following requirements for discharging to sand filters apply when sand filters are used to treat backwash wastewater from iron and manganese removal filters:

(i) Filters shall be designed for a rate of thirty-five (35) gallons per square foot per day except where testing indicates that higher rates will not cause excessive plugging of the media and a quality effluent can be maintained. Sufficient surface area shall be provided so that during any filtration cycle the wastewater depth over the media does not exceed two (2) feet. The filters shall be sized to handle the entire backwash volume from all of the filters at the treatment plant unless the filters are washed on a rotating schedule.

(ii) No filter, regardless of the volume of water to be handled, may be smaller than one hundred (100) square feet in area. Multiple units may be necessary to facilitate cleaning.

(iii) The filter media shall consist of a minimum of twelve (12) inches of sand, three (3) to four (4) inches of supporting small gravel or

torpedo sand, and nine (9) inches of gravel in graded layers. All fines shall be removed from the media by washing. The filter sand shall have an effective size of three tenths (0.3) millimeters to five tenths (0.5) millimeters and a uniformity coefficient not exceeding three and five tenths (3.5).

(iv) An adequate under drainage collection system shall be provided. Provisions shall be made for sampling the filter effluent.

(v) A cover shall be provided which prevents freezing during the winter months.

(vi) The filter shall be located in an area not subject to flooding, and the site shall be graded to prevent ponding of surface runoff. Finished grade elevation shall be designed to facilitate maintenance, cleaning and removal or replacement of surface sand. An overflow may not be provided.

(C) Lagoons used to settle backwash wastewater from iron and manganese removal filters shall meet the following design requirements:

(i) Lagoons shall be designed with a volume which is ten (10) times the total quantity of wastewater discharged during any twenty-four (24) hour period.

(ii) Lagoon length shall be four (4) times the width, and the width shall be at least three (3) times the depth.

(iii) Adequate inlet and outlet devices shall be provided so that velocity currents are minimized.

(D) Detention tanks used to settle backwash wastewater from iron and manganese removal filters shall meet the following design requirements:

(i) Detention tanks shall be designed to maximize settling by means of inlet piping and baffling configurations. Tanks shall be of sufficient capacity to hold at least two (2) complete backwash cycles. The floor shall be sloped to a sump and access manholes provided to facilitate cleaning. A cover shall be provided to prevent freezing.

(ii) Pumps shall be provided to discharge the decantate to a storm sewer or receiving watercourse over approximately a twenty-four (24) hour period. A convenient means of sampling the effluent shall be provided.

(E) Refer to 327 IAC 6-1 for requirements for land application of sludge from a water plant.

(b) Aeration treatment devices described in this section may be used for oxidation, separation of gases or for taste and odor control. The following requirements shall be met:

(1) The design for natural draft aeration shall provide that:

(A) Water is distributed uniformly over the top tray.

(B) Water is discharged through a series of three (3) or more trays with separation of trays not less than 6 inches.

(C) Trays are loaded at a rate of one (1) gallon per minute to five (5) gallons per minute for each square foot of total tray area.

(D) Trays have slotted, woven wire cloth or perforated bottoms.

(E) Perforations are three-sixteenths (3/16) to one-half (1/2) inches in

- diameter, spaced one (1) to three (3) inches on centers, when perforations are used.
- (F) Eight (8) to twelve (12) inches of inert media are used, such as coke, limestone or plastic, that will not disintegrate due to freezing cycles.
- (2) Forced or induced draft aeration devices shall be designed to:
- (A) Provide adequate countercurrent flow of air through an enclosed aeration column.
 - (B) Be insect-proof and light-proof.
 - (C) Have the air intake located above grade and the air introduced into the column passed through insect-tight screen and be as free of dust as possible.
 - (D) Insure that the water outlet is adequately sealed to prevent unwanted loss of air.
 - (E) Insure that the sections of the aerator can be easily reached and removed for maintenance.
- (3) Pressure aeration may be used for oxidation purposes if a pilot plant study indicates the method's effectiveness. Pressure aeration will not be approved for removal of dissolved gases. Pressure aeration devices shall be designed to meet the following requirements:
- (A) Filters following pressure aeration shall have adequate exhaust devices for release of air.
 - (B) Pressure aeration devices shall be designed to cause a thorough mixing of compressed air with water being treated, and shall provide screened and filtered air, free of obnoxious fumes, dust, dirt and other contaminants.
 - (C) Air compressors shall be oil free.
- (4) Other methods of aeration may be permitted if their effectiveness is demonstrated and approved by the department. Methods include but are not restricted to spraying, diffused air and mechanical aeration. The treatment processes shall be designed to meet the particular needs of the water to be treated.
- (5) Requirements for packed column aerators are as follows:
- (A) Tower requirements for packed column aerators are as follows:
 - (i) The tower shell construction shall be made of material compatible with potable water and shall be resistant to the aggressiveness of the water and dissolved gasses.
 - (ii) A water distribution system shall be provided that distributes the water evenly over the packing.
 - (iii) Adequate packing support shall be provided to prevent packing deformation.
 - (iv) A moisture barrier shall be provided to prevent tower misting and icing.
 - (v) Access manholes shall be provided in the side of the tower for facilitating inspection and replacement of the packing material.
 - (vi) An access ladder with a safety cage shall be provided.
 - (vii) Adequate foundation and lateral support shall be provided to prevent overturning due to wind loads.
 - (viii) A screened, rain proof, outlet for air exhaust shall be provided.
 - (B) Packing requirements for packed column aerators are as follows:

- (i) The packing material shall be compatible with use of potable water and shall be resistant to the aggressiveness of the water and dissolved gasses.
 - (ii) A method of cleaning the packing shall be provided where iron or manganese could be responsible for fouling the media.
- (C) Blower requirements for packed column aerators are as follows:
 - (i) The blower shall be provided with a weather-proof motor, a tight housing and an adequate foundation.
 - (ii) The blower inlet shall be provided with an insect screen and a dust filter.
 - (iii) A method for measuring air flow shall be provided.
 - (iv) The blower shall be adequately sized to provide sufficient air to achieve the desired removal rates.
- (D) Other requirements for packed column aerators are as follows:
 - (i) A means shall be provided to drain the influent riser and the tower upon pump shut down.
 - (ii) All buried piping shall be maintained under a positive pressure greater than the elevation of the ground surface.
 - (iii) Influent and effluent sampling faucets shall be provided.
 - (iv) A meter shall be provided to determine water flow to the tower.
 - (v) The water passing through the tower shall be continuously disinfected and provided with a minimum of thirty (30) minutes of contact time.
 - (vi) A means of bypassing the tower shall be provided.
 - (vii) Air emission controls shall be provided if necessary to meet air quality standards.
- (6) Aerated water shall receive disinfection treatment.
- (7) Aerators that discharge through the atmosphere shall be protected by being placed in a louvered enclosure designed to provide easy access to the interior.
- (8) Aerators that are used for oxidation or removal of dissolved gases from waters that will be given no further treatment other than chlorination shall be protected from contamination from insects and birds and wind borne debris or dust.
- (9) Aerators shall be inspected (HOW OFTEN) and equipment shall be provided to test for dissolved oxygen (DO), Ph, and temperature to determine proper functioning of the aeration device.
- (c) Rapid mix shall mean the rapid dispersion of chemicals throughout the water to be treated, usually by violent agitation. Requirements for rapid mix shall meet the following:
 - (1) Basins shall be equipped with mechanical mixing devices unless other methods, such as baffling, or injection of chemicals at a point of high velocity, are approved by the agency after determining that the other requirements of this section will be met. Variable speed drive equipment is recommended.
 - (2) The detention period for mechanical mixing shall be as short as possible depending upon the velocity gradient provided by the mixing units.
 - (3) The rapid mix and flocculation basin shall be as close together as possible.
 - (4) A rapid mix device or chamber ahead of the solids contact unit may be required

by the agency.

(5) Duplicate units for rapid mix, flocculation and sedimentation need not be provided unless the treatment process units will be taken out of service for more than one day at a time for maintenance.

(d) Clearwell requirements are as follows:

(1) Clearwell storage shall be sized, in conjunction with distribution system storage, to relieve the filters from the strain of fluctuations in water use or peak demands.

(2) When finished water storage is used to provide proper contact time for disinfection, documentation shall be provided to assure adequate detention time under all operating conditions. The installation of baffle walls or additional reservoir capacity may be required where necessary to prevent short circuiting and to obtain adequate contact times.

(3) At plants treating groundwater, a provision shall be made for applying chlorine to the raw water and the clearwell inlet or the high-lift pump discharge piping.

(4) Residual levels of total chlorine shall be maintained at least at one (1) milligram per liter.

(e) Electrical (Black boxes) main switch gear electrical controls shall be located above grade, in areas not subject to flooding.

(f) Requirements for taking treatment units off line and placing treatment units back on line are as follows:

(1) The agency shall be notified by the public water supply official as to the nature of the facility being taken off line and when they expect to be back on line.

(2) Newly constructed or repaired water distribution mains, treatment units and finished water storage facilities shall be flushed and disinfected before use in accordance with methods acceptable to the agency.

(3) Samples will be taken to determine the adequacy of disinfection following line installation, replacement, or repair.

(4) Water samples shall also be required for the determination of the adequacy of the source, storage, treatment or distribution of water to the public. The amount of samples that are required shall be determined by the agency.

(g) Separation distance between chemical feeds? (Ask workgroup)

(h) Residual management requirements are as follows:

(1) Facilities for disposal of sludge are required by the agency. The sludge removal design shall provide for the following:

(A) Sludge pipes not less than three (3) inches in diameter and so arranged as to facilitate cleaning.

(B) Entrance to sludge withdrawal piping to prevent clogging.

(C) Valves located outside the tank for accessibility.

(D) Provisions for the operator to observe and sample sludge being withdrawn from the unit.

(E) Sludge disposal sections 327 IAC 6-1 contain additional specific requirements for sludge disposal. Flushing lines or hydrants shall be provided to back flush sludge lines and basins or for other purposes. Protection shall be provided for all potable water lines used if potable water could become contaminated by nonpotable water.

(2) Suggestions from workgroup